CSSE 220 Day 19

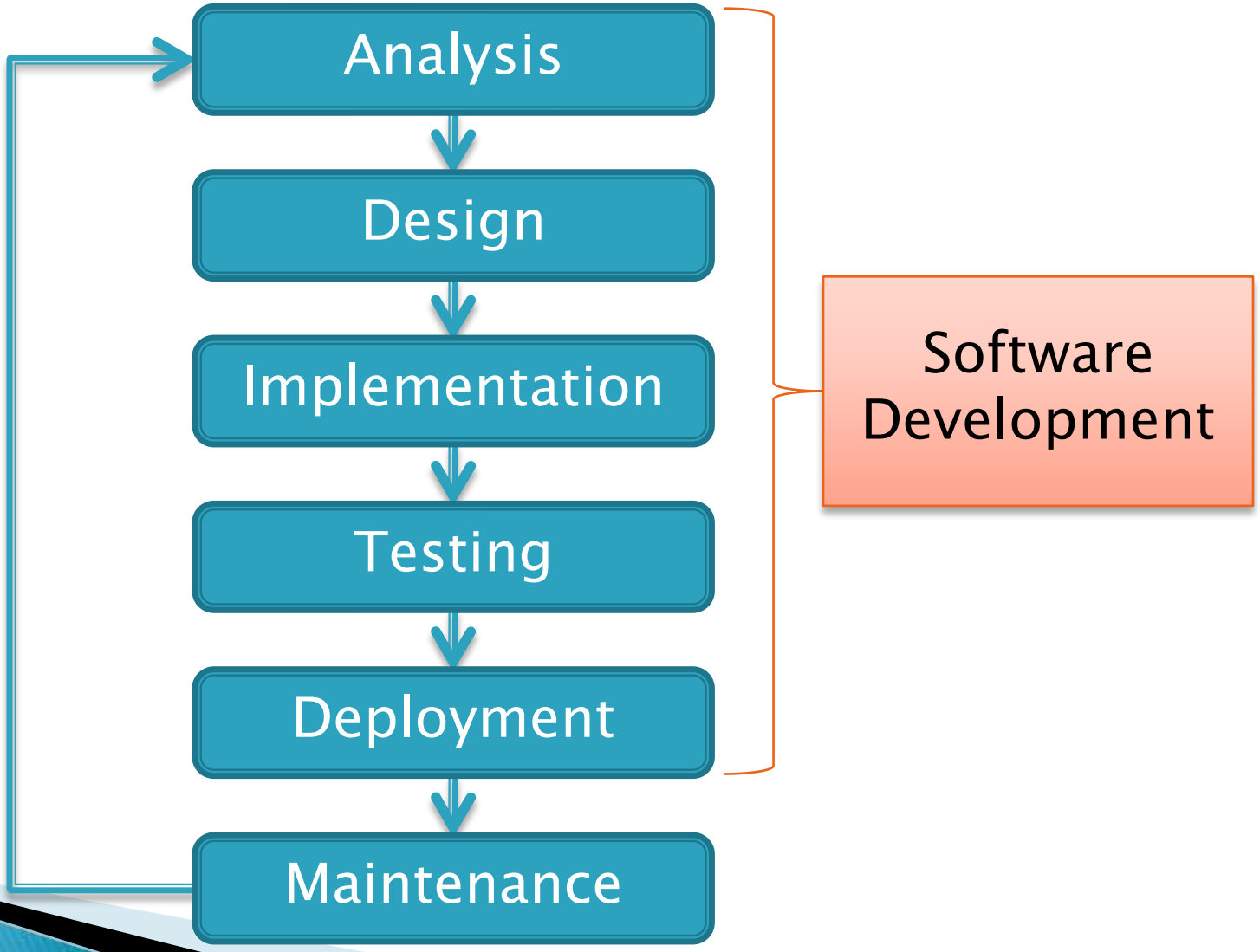
Object-Oriented Design

No SVN checkout today

Questions?

Software Development Methods

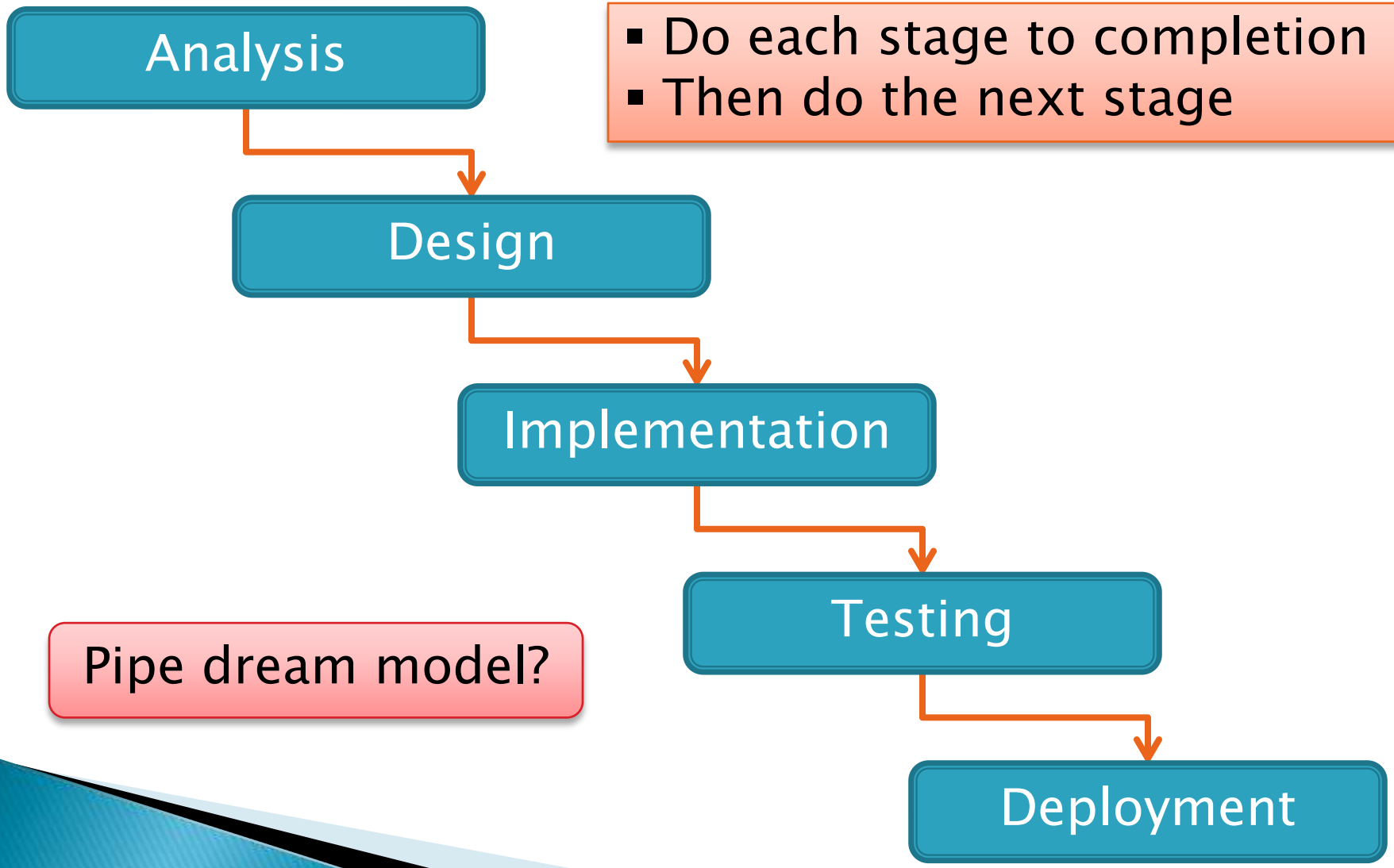
Software Life Cycle



Formal Development Processes

- Standardized approaches intended to:
  - Reduce costs
  - Increase predictability of results
- Examples:
  - Waterfall model
  - Spiral model
  - “Rational Unified Process”

Waterfall Model



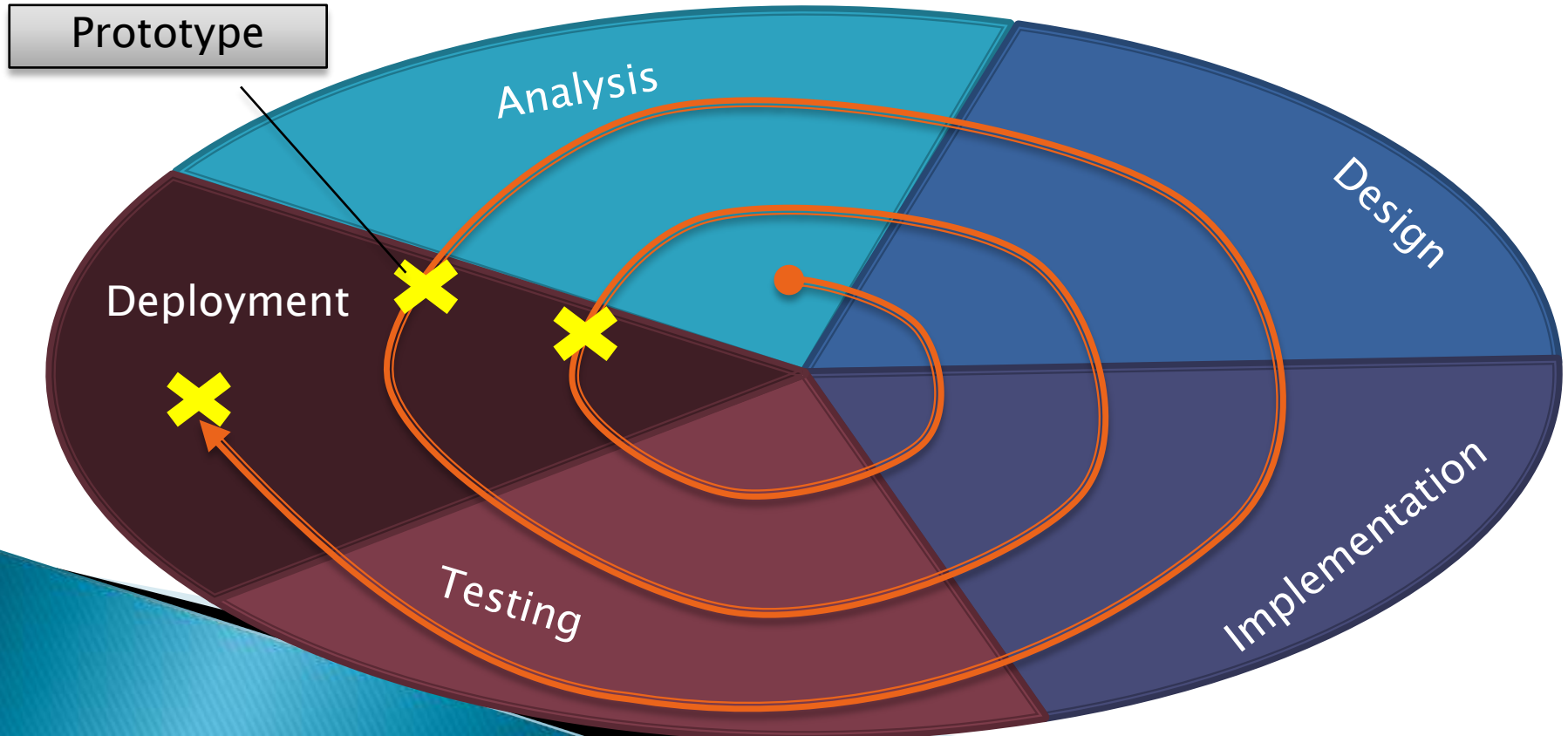
- Do each stage to completion
- Then do the next stage

Pipe dream model?

Spiral Model

- Schedule overruns
- Scope creep

- Repeat phases in a cycle
- Produce a prototype at end of each cycle
- Get early feedback, incorporate changes



Extreme Programming—XP

- Like the spiral model with **very** short cycles
- Pioneered by Kent Beck
- One of several “agile” methodologies, focused on building high quality software quickly
- Rather than focus on rigid process, XP espouses 12 key practices…

The XP Practices

- Realistic planning
- Small releases
- Shared metaphors
- Simplicity
- **Testing**
- **Refactoring**
- **Pair programming**
- Collective ownership
- Continuous integration
- 40-hour week
- On-site customer
- **Coding standards**

When you see opportunity to make code better, do it

Use descriptive names

Q1

Object-Oriented Design

- A practical technique

Object-Oriented Design

- We won't use full-scale, formal methodologies
  - Those are in later SE courses
- We will practice a common object-oriented design technique using CRC Cards
- Like any design technique, **the key to success is practice**

Key Steps in Our Design Process

1. **Discover classes** based on requirements

2. **Determine responsibilities** of each class

3. **Describe relationships** between classes

Discover Classes Based on Requirements

- Brainstorm a list of possible classes
  - Anything that might work
  - No squashing
- Prompts:
  - Look for **nouns**
  - Multiple objects are often created from each class → so look for **plural concepts**
  - Consider how much detail a concept requires:
    - A lot? Probably a class
    - Not much? Perhaps a primitive type
- Don't expect to find them all → add as needed

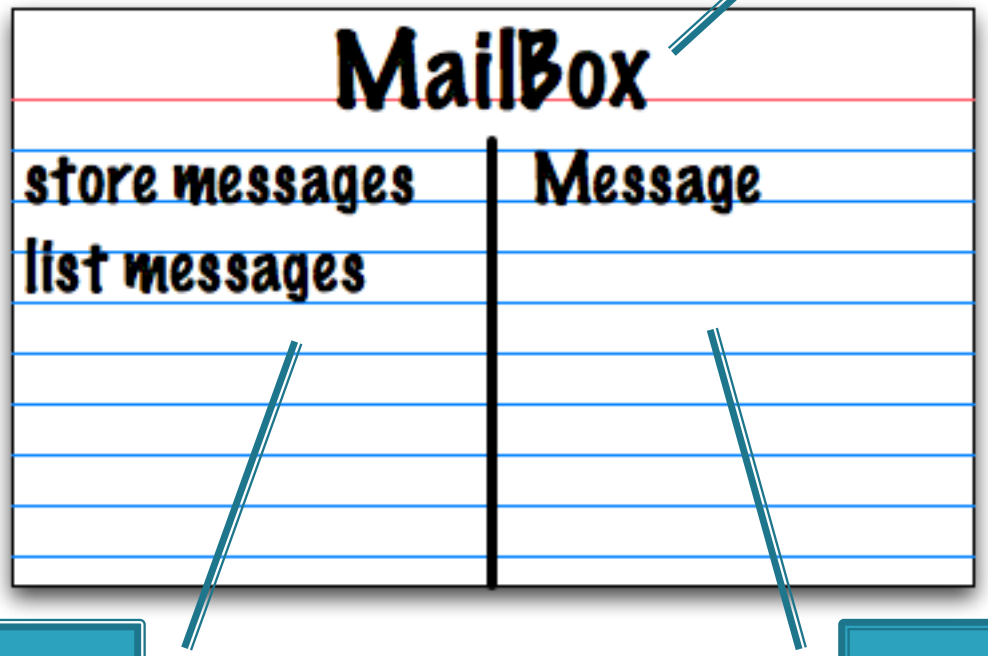
Tired of hearing this yet?

Determine Responsibilities

- Look for **verbs** in the requirements to identify **responsibilities** of your system
- Which class handles the responsibility?
- Can use **CRC Cards** to discover this:
  - **Classes**
  - **Responsibilities**
  - **Collaborators**

CRC Cards

- Use one index card per class



CRC Card Technique

1. Pick a responsibility of the program
2. Pick a class to carry out that responsibility
   - Add that responsibility to the class's card
3. Can that class carry out the responsibility by itself?
   - Yes → Return to step 1
   - No →
     - Decide which classes should help
     - List them as collaborators on the first card
     - Add additional responsibilities to the collaborators' cards

CRC Card Tips

- **Spread the cards out** on a table
  - Or sticky notes on a whiteboard instead of cards
- **Use a "token"** to keep your place
  - A quarter or a magnet
- **Focus on high-level responsibilities**
  - Some say < 3 per card
- **Keep it informal**
  - Rewrite cards if they get to sloppy
  - Tear up mistakes
  - Shuffle cards around to keep "friends" together

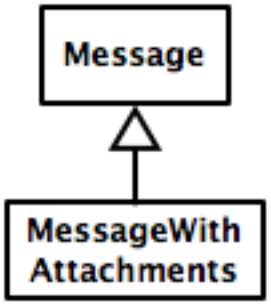
Describe the Relationships

- Classes usually are related to their collaborators
- Draw a UML class diagram showing how
- Common relationships:
  - **Inheritance**: only when subclass **is a** special case
  - **Aggregation**: when one class **has a** **field** that references another class
  - **Dependency**: like aggregation but transient, usually for method parameters, **"has a" temporarily**
  - **Association**: any other relationship, can label the arrow, e.g., **constructs**

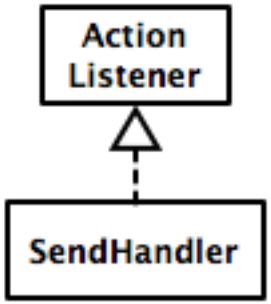
NEW!

Summary of UML Class Diagram Arrows

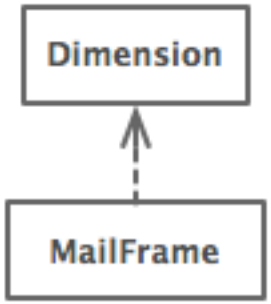
Inheritance (is a)



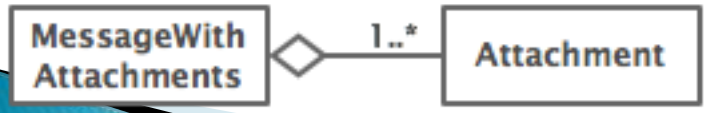
Interface Implementation (is a)



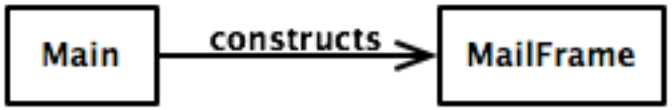
Dependency (depends on)



Aggregation (has a)



Association



Homework 18 Due Wednesday

- Finish BallWorlds with your partner
- Do Appointment Calendar design exercise
  - You might want to try using Violet for drawing your diagrams

BallWorlds Work Time

- Ask questions if you're stuck!